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ABSTRACT

This paper discusses the development and implementation of a cost analysis model for use by curriculum planners and developers in evaluating educational programs. The paper consists of four major sections that focus in turn on the need to approach educational costs from a nontraditional perspective, development of a cost model, implementation of the model, and results of implementing the model. After presenting a functional cost analysis matrix and discussing its development, the author describes how the model was field-tested using competency-based teacher education programs in New York universities. Based on this field test, the author concludes that functional costs analyses appear to be a viable alternative to current jurisdictional cost procedures, and that the cost analysis matrix is a valid tool from which to construct a functional cost study. (JG)

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APPLICATION OF AN ALTERNATIVE COST ANALYSIS MODEL TO EDUCATIONAL PROGRAMS

by Albert E. Beilby
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This paper describes the development and testing of a model which addresses problems of costing educational programs. Four major areas are discussed:

1. The need to approach educational costs from a non-traditional perspective.
2. Development of a cost model.
3. Implementation of the model.
4. Results of implementing the model.

A summary will discuss the import of this particular study on educational costing.

Background and Rationale

To evaluate an educational program we need information about a program's effectiveness for increasing student learning and the program's cost. Cost effectiveness analysis has become a standard evaluative approach to secure this information. Many cost effectiveness studies have been conducted in which the primary focus has been on identifying program outcomes and effectiveness measures.

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EA 009 807

Very little attention has been given to the cost side of cost effectiveness. The most common approach to attaching costs to outcomes has been to allocate institutional finance data across various departments by some standard or proportional distribution rule. Little or no attempt is made to determine how closely these allocated costs reflect reality. The prevailing philosophy has been to accept the dollar amounts reported in financial statements as "Truth". After all, the debits and credits are shown to balance to the penny.

Although not commonly recognized by laymen, cost accountants' figures are estimates rather than reality; they are real only by consensus. The practice of allocating institutional costs across departments and programs creates an unclear picture of resource consumption. It is difficult, if not impossible, to express the functional relationship between program cost and program outcomes. What follows is a proposal for an alternative approach to determine program costs. In effect, the proposed approach is an attempt to refine cost estimates and to functionally relate costs to outcomes.

Since at least 1965, when Jones (1965) examined costs of alternative instructional strategies at Michigan State University, the term "functional costing" has been used by a small circle of analysts to describe cost procedures which attempt to relate program costs to program outcomes. Conventional costing procedures typically have as cost centers an organizational unit over which some specific administrator has jurisdiction. The term used to describe these procedures is "jurisdictional costing".

It is important to make a distinction between jurisdictional costing and functional costing.

Jurisdictional costing refers to the common practice of organizing costs according to the administrative organization of an institution. A jurisdictional cost structure reports costs by gross categories for colleges, divisions, or departments. To arrive at some smaller unit the reported jurisdictional cost may be averaged over all sub-units.The fact that the reported jurisdictional cost may already contain allocated costs of dubious accuracy compounds the problem of getting a clear, accurate statement of costs for any sub-unit.

Functional costing is an attempt to relate costs to outcomes. The most familiar approach has been program budgeting (PPBS). However, the emphasis of program budgeting has been on identifying programs, not on identifying costs. In program budgeting, jurisdictional costs are allocated to defined programs through fairly simplistic formulae. The practice results in program cost figures which include costs irrelevant to the program.

Functional costs build upon existing financial records, but not on formal financial statements, that is, raw data such as equipment costs and personnel salaries are taken from records but assembled in a manner to reflect actual resource consumption by a program.

Non-cost data are required to establish functional costs. For example, it is useful to know a program's actual use of equipment, personnel, or other resources which may be shared with other programs. Such information can be attained only by collecting original data.

In early attempts to apply functional costing to educational programs (Jones, 1965; General Learning Corporation, 1969), the program outcomes served as functions. In more recent applications (Chappel, 1970; Doughty, 1972; Belmore, 1972) the term "functional" has taken an added dimension by recognition

and inclusion of life-cycle costing. Figure 1, adapted from studies sponsored by Rand Corporation (McCullough, 1966), illustrates the life-cycle cost concept. The life-cycle of a program is shown as consisting of three phases: a research and development phase, an investment phase, and an operation phase. Furthermore, as shown in Figure 1, these phases may overlap in time. Expressing costs in terms of these phases would be beneficial in program evaluation since that would allow decision makers to attribute costs to some developmental phase of a program in addition to a particular program outcome.

Model Development

Development of the functional cost model used in this study will now be described.

Figure 2 represents initial conceptualization of a functional cost study. The matrix, adapted from Doughty (1972), represents a strategy for categorizing costs for program outcomes. The vertical axis contains the three life-cycle phases of Figure 1; here the terms Design, Investment/Production and Operation are used to better reflect development and implementation of an educational program. The horizontal axis contains cost categories or account names.

One of the more frustrating aspects of financial accounts is the lack of uniformity in naming them. A review of nineteen cost studies (Doughty and Beilby, 1974) revealed 94 distinct account names. Thirteen of the names were some variant for "materials and supplies".

The diversity in names for education financial accounts required a selection or adaptation of account categories. To develop categories that would enhance data reliability, judges were asked to cluster the 94 cost

Figure 1

Life-Cycle Costing

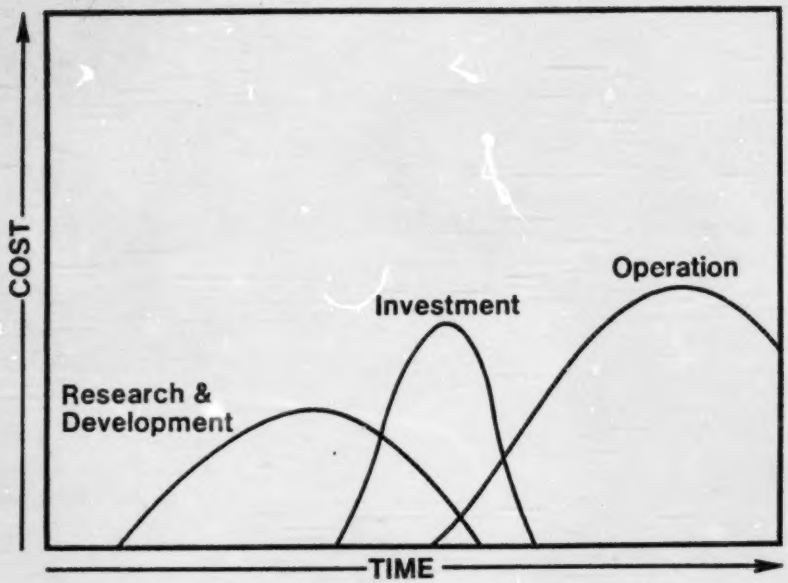


Figure 2

Conceptual Framework for a Functional Cost Analysis

Life Cycle Phases \ Cost Categories	Category 1	Category 2	Category 3	Category 4...n	Total Costs
Design	$	$	$	$	$___
Investment/ Production	$	$	$	$	$___
Operation	$	$	$	$	$___
Total Costs:	$___	$___	$___	$___	

account names under categories developed by the author.

Inter-coder agreement between three judges was computed by Scott's (1955) index of reliability. Figure 3-A gives the formula for this index and observed intercoder agreements. In the formula, Po refers to observed agreements and Pe refers to agreements to be expected by chance. Agreement to be expected by chance was computed to be 0.14. The observed agreements contained in Figure 3-B were significant at $p = 0.001$.

Figure 4, which is a refinement of Figure 2, contains the categories resulting from the process just described. To implement the study, this matrix was used as a guide to generate data collection instruments. That is, questions were generated to collect data for each cell except the Operation/ Facilities cell which, for the purposes of this study, was viewed as an irrelevant cost. The only facilities cost considered in the study was the investment made to alter existing facilities.

Questionnaires underwent a series of pilot tests until the final format was achieved. The final questions focused on activities for some purpose which would occur in an education program during one of the three life-cycle phases. Judges were asked to place activity statements into one of the three life-cycle phases in order to determine the reliability with which responses to questions could be categorized. Intercoder agreement among three judges is shown in Figure 3-B.

Agreement expected by chance was 0.34. These observed agreements were significant at the $p = 0.001$ level.

So far, the general framework for the study has been presented (Figure 2) and the development of the specific framework for the study (Figure 4) has been described. A major portion of the questionnaire developed from Figure 4 is

COST ANALYSIS MATRIX

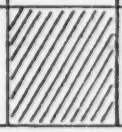
CATEGORIES / PHASES OF INSTRUCTION	PERSONNEL		ADMINIS-TRATION	SER-VICES	HARD-WARE	SOFT-WARE	FACILI-TIES	TOTAL
	SALARIES AND BENEFITS	CONSUL-TANTS						
DESIGN								
INVESTMENT/ PRODUCTION								
OPERATION: ONE CYCLE								

FIG. 4 Generic cost analysis matrix.

Scott's Index $\pi = \frac{Po - Pe}{1 - Pe}$

intercoder agreements at p = 0.001		A	B
	C	0.81	0.86
	B	0.93	1.00

Figure 3A: Formula for Scott's Index of Reliability and observed intercoder agreements for cost categories.

	A	B
C	0.72	0.86
B	0.68	1.00

p = 0.001

Figure 3B: Intercoder agreement for categorizing activities by life-cycle phase.

contained in Appendix A. Not included in Appendix A are forms on which support personnel reported and on which support services were identified.

We will now move to implementation of the study.

Implementation: Methods and Procedures

At the outset, Competency-Based Teacher Education (CBTE) programs were targeted as the group on which the cost model would be tested. Any educational program would have served, but on a number of counts competency-based programs seemed a logical choice. First, outcomes of the programs were supposed to be tightly defined. Secondly, controversy and claims that competency-based programs were more costly than conventional teacher education programs gave program administrators a reason for being interested in costs.

Administrators were indeed interested in CBTE costs. Although, as it turned out, key programs which would have increased representativeness of the study were not anxious to participate. The major problem seemed to be identifying programs far enough along in 1975 to have implemented a full semester of CBTE. While there was much rhetoric, there were few programs up and going.

The newness of CBTE and diversity of approaches suggested that a national sample of competency-based programs would be no more representative than a state or regional sample. Therefore, the cost-study was limited to programs in New York State. The conveniences and reduced expense of conducting an in-state study were also factors in limiting the study to New York. Furthermore, teacher training institutions in the State were under administrative mandate to establish CBTE and implementation deadlines had been set.

Programs included in the study were limited to four for ease of handling.

The programs were not selected randomly because of the small sample (which was to plague the study throughout). An attempt was made to represent geographic regions and the three New York State institutional groups of SUNY, CUNY, and PUNY; the latter reference being to private universities. Unfortunately, few CUNY units had implemented a CBTE program; those that had were not receptive to the cost study. The final study composition is shown in Table 1. It was not as representative as originally intended.

Self administered questionnaires were selected as the data collection method. There were several reasons for this choice. First, the investigator was anxious to produce simple, self-administered, validated instruments which required minimal investment of money and time for data collection. Second, other options were not feasible. Diaries of personnel activities could not be examined because there were no diaries. Observation, so useful in industrial time and motion studies and in cataloging a variety of activities, was not appropriate because of the non-repetitive dynamics inherent in instruction at the post-secondary level. Interviews were ruled out because the number of programs and personnel were beyond the investigator's resources. None of these alternative approaches was conducive to self administration.

To increase the probability that faculty would complete and return questionnaires, a meeting was held with program personnel to explain concepts and procedures of the study. In addition, a liaison person was designated at each site. More time was spent with the liaison than with other personnel in order to describe subtler aspects of the study and to establish timelines for data collection. The liaisons received remuneration for their effort and became the primary program contact.

Data collected were purchase or rental prices, salaries and time. Cost

of equipment, supplies, software and hardware was identified, personnel salaries were determined, remitted tuition was considered. The number of hours personnel committed to the program and their use of various resources was determined through self-reported responses to the questionnaires. Hourly data, purchase prices and salary figures were combined to produce cost data.

To set parameters for the study, a single semester was to serve as the focus of data collection. That is, participants were asked to report time involved in planning, implementing and evaluating a single semester. This required participants to identify and include planning for the semester which actually preceded the semester's start and also evaluation efforts which may have extended beyond the semester. Data were computed and cost analysis reports were returned to each program. Appendix B consists of selected pages from a cost analysis report.

In cost analyses reports, costs were reported for the entire program and by competency clusters which were organized according to a conventional course format (see Tables I and II, Appendix B). In the case of total program costs, computations from raw data were presented, then the data were manipulated to isolate design costs and amortize them over a number of cycles.

The rationale for amortizing design costs is as follows: design costs are analogous to industrial "research and development" costs. They may not provide an immediate return on investment, and to assign all design costs to the immediate semester or course cycle may not be the most realistic way of treating them. With that in mind, the assumption was made that one-third of the design costs would have a direct impact on subsequent cycles of a course. This information was incorporated as an optional set of figures in all report tables.

In addition to total program costs, total costs were calculated for each competency cluster and were further reduced to provide costs for each life-cycle phase. In all instances both raw data and data indicating amortization of design costs were given (see Tables III and IV, Appendix B).

Appendix B also contains charts and figures indicating relations between enrollment and operation costs, and describes how equipment costs were determined. Other types of information contained in the reports include cost per pupil and analysis of costs by categories and life-cycle phases.

Analysis of Results

Findings will now be reported concerning:

1. the acceptance of the functional cost analysis by participants;
2. the acceptance of procedures used in the study;
3. the reliability of participant estimates concerning time and use;
4. the validity of the questionnaire, cost analysis reports, and cost matrix.

The small sample size and (usually) nominal data were not amenable to inferential statistical analysis. Therefore, much of the study findings are based on descriptive statistics.

Following initial data collection, participants were asked to respond to questions about functional costing and about data collection procedures. Respondents were selected by the program liaison persons. The number of persons responding to the evaluation is given in Table 1. Only three programs responded. Summer recess and resultant delays caused the investigator to abandon the evaluation at the fourth program.

Table 2 reports participant reaction to the amount of time required to complete the questionnaire. Table 3 reports participant attitude toward the

TABLE 1

Composition of Cost Study

Program	Institution Type & Location	# Faculty	# Students	# Respondents Who Evaluated Study
A	Small, Private, Downstate	8	32	8
B	Small, SUNY, Central N.Y.	10	13	5
C	Large, Private, Central N.Y.	7	28	5
D	Large, Private, N.Y.C.	7	27	0

TABLE 2

Participant Reaction to the Amount of Time Required to Complete Questionnaires

Reaction	n	% N
No answer	1	6
Time was not the problem, forms were too difficult	6	33
Time required was O.K.	4	22
Too much time required (negative response)	7	39
	18	100 %

TABLE 3

Attitude of Participants Toward Data Collection Instruments

Response Category	n	% N
Negative	12	67
Positive	4	22
Anxiety	2	11
	18	100 %

TABLE 4

Most Troublesome Aspects of Questionnaires

Problem	n	% N
No problems identified	6	33
Everything in general	2	11
Unclear directions or terms	3	17
Estimation process	7	39
	18	100 %

TABLE 5

Participant Reactions to Functional Cost Analysis

Participant Response	n	% N
Desirable	9	50
Not desirable	4	22
Not qualified to judge	2	11
No answer	3	17
	18	100 %

questionnaire. Table 4 reports the most troublesome aspects of the questionnaire. Taken together, the tables suggest the questionnaire was not well received. Anecdotal data would convince you they were not. Why were 67% of the responding participants negative about the questionnaire? It is long and it required considerable fortitude to sit down and thoughtfully generate the required information.

In spite of a bad experience with the questionnaires, Table 5 indicates that 50% of the participants found a functional cost analysis desirable. Had the questionnaire been more palatable, more participants may have found functional costing "desirable".

Reliability. Reliability of estimates was determined from two perspectives. First, since these data were ordinal, Pearson's r and the reliability coefficient were computed. Results are contained in Table 6. Some fairly strong correlations were noted, but notice the standard error of estimate. While there appeared to be consistency, there was considerable variability between the first and second estimates.

The second approach to reliability was to compute intracoder agreements. Here a peculiar problem had to be dealt with. One would not expect two estimates about time spent on a generally defined task to be precisely the same. It would vary according to the precision with which the task is defined and with the magnitude of the number of hours devoted to the task. Some guides for tolerance were arrived at through the aid of judges, and these tolerance ranges were incorporated into the reliability computations. A summary of intra-coder reliability results is contained in Table 7. They were low.

Validity. Lack of estimate reliability was a blow to all forms of validity except content validity. The reliability coefficients suggest, in

TABLE 6

Correlation and Reliability Coefficients of Estimates

Estimate Cluster	N	r	r^2	sig.	std. error of est.
All Estimates	13	0.69	0.48	0.004	156.4
	12*	0.99	0.98	0.00001	33.6
Planning; designing materials; selecting materials; etc.	13	0.86	0.68	0.0002	54.9
Research to increase personal knowledge about CBTE.	13	0.89	0.79	0.0002	7.9
Purchases; production of materials for class use; related activities.	13	0.63	0.41	0.009	13.9
Instruction; student evaluation.	13	0.49	0.24	0.044	73.1
	12*	0.99	0.98	0.00001	12.6
Advising students not in course taught but who are in CBTE program.	13	-0.04	0.002	0.444	11.8
Disseminating information about program.	13	0.68	0.47	0.005	8.4
Value of software consumed.	13	-0.13	0.02	0.332	17.2
Use of hardware.	13	0.22	0.05	0.233	11.4
	12*	0.87	0.76	0.00009	5.8

* N of 12 indicates recomputation to eliminate an extreme case.

TABLE 7

Summary of Intracoder Reliability Results

N	Range	Mode	MDN	MN	SD
13	0.25-0.87	0.37	0.50	0.52	0.25

fact, that the questionnaires did possess content validity. Additional support was obtained from participant evaluation of the cost analysis reports. Tables 8 and 9 report these evaluations.

To summarize some of the more salient features of Tables 8 and 9:

53% of the participants indicated they viewed the report favorably;

77% indicated they understood all or most of the report;

85% indicated that reported data were at least moderately valid and reliable;

67% indicated that reported data were at least moderately valuable to them;

100% (of those answering the question) reported that some cost data confirmed their beliefs about costs.

The data suggest that reports possess content validity and this in turn has a bearing in the content validity of the questionnaires and the matrix; since the reports were developed from the questionnaires which were developed from the matrix.

Summary

To briefly summarize the major study outcomes:

1. The questionnaire was not liked;
2. Even so, the concept of functional costing is workable and evidently acceptable;
3. The faculty estimates were not very reliable;
4. But, the instruments used in the study appear to be valid.

Two of these outcomes are positive and two are negative. To accentuate the positive : functional cost analyses appear to be a viable alternative to current jurisdictional cost procedures, and the cost analysis matrix was shown to be a valid, useful tool from which to construct a functional cost study.

TABLE 8

RESPONSES TO PART I OF THE EVALUATION OF THE COST ANAYLSIS REPORT
GENERAL NATURE OF THE REPORT

Question	Number of Responses by Category			
1. How do you view report?	Favorably=7***	Unfavorably=1	Neutral=5* ⊕	
2. Do you understand report?	All=2	Most=8***	Some=3* ⊕	None=0
3. What parts do you not understand?	No answer=3	Tables=3*	Inconsistent terminology=2*	How unit costs were obtained=1
	Accuracy of report=3* ⊕	Distinction between design and operation=1*		
4. What general information is extraneous?	No answer=2	Nothing=4**	Equipment/hardware costs=6** ⊕	Too many tables=1
5. What general information is key?	Cost/pupil=10***	All costs=2* ⊕	Weakness of data collection method=1	
6. What parts of report would you change?	No answer=2	More visual representations=2**	Greater consistancy of terms=2 ⊕	Add directions about how to use data=1
	Clarify allocation of design costs=1*	Add measure of outcome quality=2	Increase time span=3*	
7. What parts of report would you continue?	No answer=8	Charts & tables=1 ⊕	"Results" section=1*	How to reduce costs=1*
	Report of raw data=1*	Hardware costs=1	Raw data and time allocation*	

Note.--Some questions and responses have been paraphrased for brevity. Original questions are contained in Appendix J.
*An asterisk indicates response of a program director. Four directors responded.
⊕ Response of financial officer.

TABLE 9

RESPONSES TO PART II OF THE EVALUATION OF THE COST ANALYSIS REPORTS
PROGRAM COST DATA

Question	Number of Responses by Category			
1. How reliable are data?	Very=4*	Moderately=7** ⊕	A little=1	Not at all=0
2. How valid are data?	Very=1* Uncertain=1	Moderately=10** ⊕	A little=0	Not at all=0
3. How valuable are data to you?	Very=1*	Moderately=7** ⊕	Slightly=4	Not at all=0
4. Which program data are extraneous?	No answer=6* ⊕	None=3*	Software & hardware costs=2*	Distinction between design & operation=1
5. Which program data are key?	No answer=3*	Cost/pupil =8* ⊕	Effect of enrollment on cost=1*	
6. Which data confirms your beliefs?	No answer=4** ⊕ Course costs=2	Most=1 High design costs=1*	Effect of enrollment on cost=3	Expense of student teaching=1
7. Which data does not confirm expectations?	No answer=7*** ⊕ Claim that student teaching costs could be reduced=1	Costs appear too low=1	Design costs seem high=1	Administrative costs seem high=1
8. Which data inspire you to change anything in program?	No answer=5** ⊕	None=3*	Question irrelevant (no authority to change)=3	Reduce administrative involvement=1
9. Which aspects of program does data encourage you to continue?	No answer=7*** ⊕	Total costs o.k.=3	Design costs o.k.=1	

Note.--Some questions and responses have been paraphrased for brevity. Original questions are contained in Appendix J.
*An asterisk indicates response of a program director. Three directors responded.
⊕ Response of financial officer.

Even the negative outcomes can be viewed positively since both strengths and weaknesses provide an indication of steps which might be taken in future cost studies. In closing, this paper will examine a few of these guideposts.

A questionnaire as lengthy and detailed as the one used in this study should be avoided. Unfortunately, most cost studies seem to employ long, detailed questionnaires with many support documents. Full acceptance and understanding of functional costing by program personnel may be the only way of avoiding such a detailed questionniare; however, such understanding is not likely to arise unless a workshop or similar training situation is implemented. Such a workshop is very desirable, but a stipend for participants should be planned in order to get the fullest attention and participation from faculty.

The study just described looked at historical costs. Current costs also need to be examined. An eventual goal is to project functional costs in order to provide decision-makers with cost effectiveness alternatives. But we need first to work in the present until a better understanding of functional costing is achieved. An advantage of working with current costs as opposed to historical costs is that the validity and reliability of cost data would be higher.

This study examined single programs in several institutions, but there is a need to examine several programs within a single institution. In such an investigation programs experiencing joint costs could be analyzed to determine how well functional costing treats these costs.

There is also a need for comparative cost studies to determine whether functional or jurisdictional reports communicate more, better.

These are directions for future investigations. There are two things

to bear in mind in any such future studies. One is that costs are estimates, and we want to refine those estimates as much as we can. The other item concerns the role of functional costing: Because of huge computer management system investments, functional costing will not immediately replace present jurisdictional cost procedures in financial accounting. Functional costing does, however, have immediate utility in program evaluation (Haller, 1974).

The study described in this paper, though not without shortcomings, was a logical step in a sequence of studies required to determine the utility of functional costing for educational programs. It is hoped that others may profit from the methods and experiences described in order that the next logical steps in the sequence may be taken.

REFERENCES

Belmore, W.E., The Application of a Cost Analysis Methodology to the Design Phase of Instructional Development. (Doctoral dissertation, Indiana University) Ann Arbor, Michigan: University Microfilms, 1972. No. 73-10, 756.

Chappell, W.G., A Model for Predicting the Unit Cost of Developing Self-Instructional Materials. (Doctoral dissertation, Michigan State University) Ann Arbor, Michigan: University Microfilms, 1970. No. 71-18, 183.

Doughty, P., Effectiveness, Cost, and Feasibility Analysis of a Course in College Level Geology. (Doctoral dissertation, The Florida State University) Ann Arbor, Michigan: University Microfilms, 1972. No. 73-10, 325.

Doughty, P., and Beilby, A., Cost Analysis and Teacher Education: A Comment on Relevant Relationships and a Review of Existing Models. Syracuse, New York: The State Education Department, Division of Teacher Education and Certification, 1974.

General Learning Corporation, Cost Study of Educational Media Systems and Their Equipment Components. Washington, D.C.: Author, 1968. 3 vols. (ERIC Document Reproduction Service, ED 024 273, ED 024 286, ED 024 281).

Haller, E.J., "Cost Analysis for Educational Program Evaluation", in W.J. Popham (ed.), Evaluation in Education, Berkely: McCutchen Publishing Corporation, 1974, 399-450.

McCullough, J.D., Cost Analysis for Planning-Programming-Budgeting Cost-Benefit Studies. Santa Monica, California: The Rand Corporation, 1966. No. P-3479.

Scott, W.A.,"Reliability of Content Analysis: the Case of Nominal Scale Coding", Public Opinion Quarterly, (1955) vol. 19, pp. 321-325/

3. This question deals with design/planning functions. These activities may have occurred far in advance of actual instruction. They must have been performed only for the cycle under discussion, i.e., if you've taught a course three times and modify materials for each cycle, consider only the modifications made for the cycle under discussion. Give <u>total hours</u> per cycle, not hours per week.

   A. Planning the form, structure or content of the <u>program</u> (not individual "courses"); i.e., arriving at a general idea of what program will be:

      TOTAL: _____

   B. Planning form, structure, and general content of "courses"; i.e., arriving at a general idea of what "course" will be:

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____

   C. Planning form, structure and content of instructional materials; i.e., specific descriptions of "course":

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____

   D. Planning facility improvements:

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____

   E. Designing instructional materials after having decided form, structure and general content (if you incorporated this data in C, go on to F):

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____

   F. Selecting instructional material already existing:

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____

   G. Research to increase personal knowledge about competency based instruction and programs:

      TOTAL: _____

   H. Formative evaluation of process, content, modules or materials:

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____

   I. Support activities for any of the above (include supervision of support personnel):

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____

4. This section focuses on investment/production functions. While the activities may have been performed far in advance of instruction, they must have been performed only for the cycle under discussion.

   A. Purchase of hardware or equipment:

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____

   B. Purchase of materials (books, paper, etc., but not office supplies not used for instruction):

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____

   C. Purchases for renovation of facilities for specific instructional purposes:

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____

      What was the total cost (including hired labor) of facility renovation?

      $ _____

   D. Production of materials for instruction or for student evaluation (not design of materials, but physical production of them):

      1. _____ 2. _____ 3. _____ 4. _____ 5. _____